



Guidance for Site Checks and Site Assessments for Underground Storage Tanks

Department of Ecology
Underground Storage Tank Program

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**Guidance for
Site Checks and Site Assessments for
Underground Storage Tanks**

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1.0 INTRODUCTION

Owners and operators of underground storage tanks (USTs) are required under Chapter 173-360 WAC to conduct a site check or site assessment to investigate for the presence of a release of a regulated substance at the time of tank closure or change-in-service (site assessment) or when evidence indicates that a release may have occurred (site check). The preamble to the EPA UST regulations indicates that the purpose of an UST site assessment is to adequately identify the presence of contamination where it is most likely to be present at the UST site. These investigations are required to be performed by a person registered with the Department of Ecology to perform site assessments under WAC 173-360-610. This document was prepared to provide guidance to tank owners and operators, as well as persons registered with the department who perform site checks or site assessments. It should be noted, however, that this guidance document is not intended to be a comprehensive "instruction manual" or textbook covering all UST systems and site conditions. The field experience of the person conducting a site check or site assessment is essential.

What are Site Checks and Site Assessments?

Site checks and site assessments are investigative actions conducted by a person registered with the department on behalf of the owner or operator of an UST to determine if a release of a regulated substance has occurred. A **site check** is the investigation of an UST site for the presence of a release when evidence indicates that a release may have occurred, but existence of such a release has not been confirmed. A **site assessment** is an investigation to determine if a release has occurred: it may be required as part of a routine closure, change-in-service, temporary closure extension, or as directed by the Department of Ecology. Situations that require a site check or site assessment are described more explicitly in Section 2 of this document.

If a confirmed release is identified in any manner and is reported within 24 hours, a site assessment is not required. Under WAC 173-340-450, a site characterization will be required.

The guidance presented here covers both site check and site assessment activities that should be performed up to the time that a release is either confirmed or disproved. Follow-up investigations to characterize the extent of a confirmed release must be conducted following guidance in the department's Guidance for Remediation of Releases from Underground Storage Tanks.

The remainder of this document is organized in seven sections. Section 2 describes situations when a site check or site assessment is required. Section 3 identifies recommended

data gathering activities that should be conducted prior to conducting field sampling for either of these investigations. Section 4 summarizes health and safety considerations and requirements associated with conducting site checks and site assessments. Section 5 presents a summary of field sampling procedures for conducting site checks/assessments. Section 6 discusses analytical requirements for laboratory analyses of samples. Section 7 summarizes quality assurance and quality control considerations. Section 8 presents guidance concerning interpretation of results from a site check or site assessment, and requirements for reporting results of site checks/site assessments.

2.0 SITUATIONS REQUIRING A SITE CHECK OR SITE ASSESSMENT

The following situations where either a site check or site assessment is required are based on the requirements of Chapter 173-360 WAC.

2.1 SITUATIONS REQUIRING A SITE CHECK

The purpose of a site check is to investigate an UST site for the presence of a release when evidence indicates that a release may have occurred. Once the existence of a release has been confirmed, the release shall be reported to the department in accordance with WAC 173-360-372 and Chapter 173-340 WAC (The Model Toxics Control Act Cleanup Regulation), as well as in accordance with Section 8 of this document. Situations requiring a site check include the following:

1. If environmental contamination from a regulated substance is discovered at an UST site which has not been permanently closed and is the basis for suspecting a release, a site check is required to confirm whether or not there has been a release from the UST system located on site. Environmental contamination may include, but is not limited to, discovery of a regulated substance or its constituents in soils, basements, sewer or utility lines, groundwater, and/or surface waters.
2. If environmental contamination from a regulated substance is discovered off site and an UST system is a suspected source of the release, the department (or delegated agency) may require a site check to confirm whether the UST system is the source of the release.

2.2 SITUATIONS REQUIRING A SITE ASSESSMENT

The purpose of a site assessment is to investigate an UST site at the time of closure or change-in-service to determine if a release has occurred. Situations requiring a site assessment include the following:

1. If an owner/operator applies to the department (or delegated agency) to extend a temporary closure of an UST system beyond 12 months, a site assessment must be completed before the application of the extension will be considered.

2. If an UST system is undergoing a change-in-service to store a non-regulated substance, a site assessment must be conducted after the tank(s) are emptied and cleaned and all liquid and accumulated sludge has been removed.
3. If an UST system is permanently closed-in-place, a site assessment must be conducted after the UST system is emptied and cleaned and all liquid and accumulated sludge has been removed.
4. If an UST system is permanently closed and the tank is removed from the ground, a site assessment must be conducted following tank removal.
5. If an UST system was permanently closed or abandoned before December 22, 1988 and the department (or delegated agency) determines that suspected releases from the UST system may pose a current or potential threat to human health or the environment, the department (or delegated agency) may require a site assessment to be conducted. *If an abandoned tank contains product, a site assessment is required.*

3.0 DATA GATHERING ACTIVITIES

Prior to conducting field sampling activities, pre-sampling activities should be completed including compiling available background information, evaluating site conditions, and preparing a field sampling plan.

3.1 SITE BACKGROUND

The items described below are generally useful information for determining if a release may have occurred. If available, these data should be collected prior to conducting field sampling activities. Data collected prior to arrival on site should be field verified as appropriate after arrival on site. For data which are not readily available, the person conducting the site check or site assessment should, based on his or her professional judgment as a registered site assessor, decide on a case-by-case basis when it is appropriate to proceed with field sampling without making additional efforts to collect missing data. This decision should be based upon the nature and extent of the missing data when evaluated against site characteristics and the perceived importance of the missing data.

Location Data: Contact appropriate individuals to obtain names and phone numbers of the business, facility/property owner(s), and facility operator(s) (if different); site address of the owner(s) and operator(s); Obtain or develop a site vicinity map or location sketch. For rural locations, the facility location description should include quarter section, township, and range.

UST System Data: Interview the owner/operator and review available UST system plans, specifications, and other information to obtain the following information:

- Date of installation and name of installer;
- Dates of use and current status;
- Number of tanks, location, capacity, dimensions, age, and material of construction of existing UST system(s), including fill pipes, vent piping, pumps, valves, distribution piping and flex connectors;
- Numbers and location of any previously removed USTs;
- Types of substances stored in USTs (current and historical);
- Depth, width, and type of bedding/backfill materials used to surround the tanks and piping;

- Types and locations of leak detection systems, secondary containment systems, and groundwater monitoring wells located on site;
- Location of any hold-down pads or deadman anchoring systems;
- History of compliance and performance:
 - Status of regulatory compliance;
 - Repair records;
 - Current permits, including permit issue dates;
 - Previous known leaks (type, volume or leak rate, and date), and
 - Inventory records
 - Tightness testing records
 - Records of water pumpouts from tanks
 - Records of neighbors complaints, and
 - Records of fire department inspections

Site Data: Review available plans for the following data:

- Property line locations;
- Distances from tank(s) to nearby structures;
- Type and location of below-ground utility lines,¹ (including water, sewer, electric, telephone and gas service lines); and
- Location of paved areas.

Hydrogeological and Soil Characteristics Review available information to determine hydrogeological and soil characteristics associated with the site, such as:

- Soil type(s) and characteristics²;
- Surface drainage characteristics of the UST site;
- Depth to groundwater, including seasonal fluctuations;
- Potential hydraulic connections between groundwater and nearby surface water;

¹Sanitary and storm sewers, water lines, and other buried utility lines and utility trenches can create pathways for released product, either liquid or vapor, to migrate in directions that are not anticipated by site soil characteristics or site hydrogeological conditions. Drywells, fill areas, basements, and crawl spaces beneath residences are other possible migration paths for released product. Nearby wells can also be a possible migration path.

²Local public work departments, irrigation districts, boring logs from any previous on-site or nearby soils investigations(s), and soil maps obtained from the Soil Conservation Service are a good source of information on the general soil characteristics of the native soils at an UST site.

- Current and potential uses of groundwater;
- Aquifer characteristics and properties;
- Locations of any existing private and public drinking water wells within a half-mile radius.
- Available data from previous soil or groundwater sampling at the site.

Land Use Review the following types of information to assist in the identification of
Data: possible alternative sources of any discovered contamination:

- Location of other nearby UST systems, either active or inactive;
- Previous site uses;
- Surrounding land uses, both current and historical;
- Other potential sources of contamination;
- Potentially sensitive receptors, both ecological and human;
- On-site waste handling practices, current and historical;

3.2 SITE INSPECTION

Some of the data items identified in Section 3.1 as site background data may actually be obtained during the site inspection. Background data collected prior to arrival on site should be field verified as appropriate. The site inspection need not be a distinct visit from the field sampling effort. However, it should occur prior to field sampling so the data obtained during the site inspection can be used to assist in determining field sampling approaches and locations. Activities that should be completed during a site inspection include:

- Visually inspect for surface indications of a release;
- Locate and verify above and below-ground components of tank and piping systems are as shown on available plans;
- Confirm fill status of tank(s);
- Compare fill status with inventory control records;
- Determine tank size - if tank system specifications are not available, estimate tank size (measure tank height through vent or fill pipe);
- Inspect site for above-ground utilities (such as power lines), and look for surface indications of below-ground utilities.

Contact the Utilities Underground Location Center (1-800-424-5555) to determine locations of below-ground utilities.

An on-site inspection of possible sources may turn up evidence of a release. The key is to look for any evidence of a release at the UST site. The following list provides examples of areas to check for leaks or releases:

- Vent pipes and fill holes - Check their condition.
- Pavement patching - Evidence that the pavement has been patched/repared may indicate that subsurface problems (e.g., tank leaks, piping leaks, pump failure) may have occurred. Check age and condition of the patched area. Look for oil stains, subsidence, buckling of pavement, etc.
- Pump Islands - Remove shielding around pumps and look for cracks and/or stains at base of pumps. Check to see if pumps are in good repair and not tilted as if they were struck. Run pumps to check for system leaks. Check to see if piping is disconnected. Look for evidence of meter tampering, abraded hoses, and gasoline-eroded asphalt in paved areas near island.
- Storm Drains - Are trench or "zipper" drains clean of oil and silt? Where do the drains lead? Any evidence of staining indicating gasoline or oil has been flushed into these drains? Any indication of excavation or other repair work around these drains?
- Fill boxes - Check to see if soil around fill boxes has been displaced by water/gasoline spills (any petroleum odor to soil?). Is box tilted in the ground? Is the box cap missing? Any excavation/repair work in evidence?
- Repair bay(s) - Look for cracks in the pavement in this area or for signs of concrete patching. Look for drains and evidence of frequent and significant spills (e.g., concrete staining/discoloration).
- Waste Oil Collection Area - Waste oil may be collected and stored in an above-ground tank, underground tank, or in drums. Look for evidence of spills around fill spouts or containment areas. Check to see if waste oil has been disposed of in on-site dry wells or pits. Has waste gasoline or waste solvents been disposed of with waste oil? If yes, establish dates. Check the inventory of any waste oil tank(s). Use a tape with water paste to check for water in the tank.
- Storm sewers - Check for evidence of product dumping in nearby storm sewers and catch basins. Check for petroleum vapors.

- Facility Records - Check inventory record book; Check tightness test records, records of water pumpouts from tanks, waste oil disposal receipts, violation orders from other agencies (if any), and other property/tank owner records, including leases. Check the alarm panel for the leak detection system. Is the power switched off?
- Bathroom(s) - Look for evidence of dumping waste oil and/or gasoline down bathroom toilets, sinks, or floor drains. Some station owners/operators dispose of the water from their gasoline tanks into these facilities, which can lead to potentially explosive vapors in sewers. Check bathroom fixtures for excessive iron staining. If the station isn't on city water, this may be a sign of groundwater contamination.
- Vapor Recovery System - Some vapor recovery lines have condensate basins. Check to see if there is any product accumulation or evidence of a leak.
- Underground Tanks - Gauge tanks with a water paste tape to check for water contamination, which may indicate groundwater infiltration. As a general rule of thumb, smaller scale tanks usually mean an older station. Check to see if Petroleum Bulk Storage (PBS) license conforms to what you find.
- Monitoring Wells - Check for evidence that previous subsurface investigations have occurred. If so, ask for results of previous reports or analyses.
- Distressed Vegetation - Look for evidence of distressed grasses, shrubs, or trees that may have been affected by a release or spill.

3.3 PREPARATION OF A FIELD SAMPLING PLAN

A brief field sampling plan must be prepared prior to conducting field sampling for a site check or site assessment. Except as provided in Section 3.4, the sampling approach and procedures identified in the sampling plan shall comply with the minimal sampling approach and procedures specified in this document. The sampling plan should summarize the following types of information:

- The conditions leading to the requirement for a site check or site assessments (i.e., tank closure, environmental contamination, etc.);
- Sampling approach and methods, including the number of samples to be collected;
- Sample locations and unique ID number for each location;
- Sample container and preservative requirements;
- Laboratory analyses to be performed;
- The name of the laboratory to be used to perform chemical analyses; and

- A description of QA/QC procedures to be used.

Individuals who perform a site check or site assessment must coordinate their sampling effort with the laboratory to which the samples will be sent for analysis. This will assure that adequate volumes of samples are collected and that samples are properly preserved and analyzed within the required sample holding time. If possible, a copy of the field sampling plan should be sent to the laboratory prior to submitting samples for analysis.

Unless explicitly requested by the department, or delegated agency, sampling plans are not required to be submitted for approval prior to sampling or as part of the reporting requirements for a completed site check or site assessment. Persons conducting site checks or site assessments should, however, keep copies of their sampling plans on file for a minimum of five years to help reconstruct sampling efforts should the need arise and to aid in legal testimony.

3.4 ALTERNATIVE SAMPLING PROCEDURES

Due to variability among UST site conditions and UST system configurations, situations will occasionally arise when the person conducting a site check or site assessment will make a determination that sampling procedures which differ from the minimum procedures specified in this guidance would be adequate. These alternative sampling procedures may be used only if they can be justified in writing. This justification must be included with the report of the site check or site assessment and will be reviewed by the department (see Section 8.2.2 for requirements for reporting results of site checks/site assessments).

Justification for alternative sampling procedures should be based primarily on technical considerations. Economic considerations alone will not be considered as an adequate basis for deviation from the sampling requirements specified in this guidance. The person conducting the site check or site assessment should demonstrate that the alternative sampling procedures used were equally as likely to determine if a release from the UST system has occurred as the sampling procedures specified in this guidance.

When reviewing results of site checks and site assessments, Ecology may determine that the use of alternative procedures has not been adequately justified. In these cases, where the results do not indicate a confirmed release, Ecology may require further justification. If satisfactory justification cannot be provided, the department may determine that a valid site check

or site assessment has not been done and require that it be redone in accordance with this guidance or a mutually determined alternative. When considering an alternative sampling plan, the person conducting a site check or site assessment is encouraged to contact UST staff at the appropriate Ecology regional office.

4.0 HEALTH AND SAFETY REQUIREMENTS

A number of site-specific factors may constitute imminent dangers to the health and safety of personnel conducting on-site UST investigations. The purpose of this chapter is to provide a general overview of health and safety considerations associated with conducting an UST site check or site assessment.

4.1 FEDERAL, STATE AND LOCAL REGULATIONS

There are numerous federal, state, and local regulations that regulate worker and public safety at hazardous waste sites and construction sites. Individuals who conduct site checks and site assessments of underground storage tanks are expected to comply with such regulations. In particular, 29 CFR 1910.120 of the Federal Register and Chapter 296-62 WAC provide regulations for individuals who are engaged in activities involving hazardous substances, including petroleum, and who perform confined space entry during field activities. In addition, Chapter 296-155 WAC provides State safety standards for construction work. Persons who conduct site checks and site assessments shall also comply with applicable OSHA regulations.

4.2 HEALTH AND SAFETY PLANNING

Preparation is the most important factor in preventing injuries during field operations. A site safety plan should be available for each site check or site assessment, and potential hazards should be identified in the plan. As with other health and safety plans for underground storage tank (UST) cleanup and spill investigations, the plan should be completed before conducting field activities for site checks or site assessments. Each field worker should then be given a copy of the plan and be informed of specific hazards. A list of topics that should be included in a site safety plan is provided in Table 4-1. The site safety plan shall also comply with Chapter 296-62 WAC.

4.3 PERSONAL PROTECTIVE EQUIPMENT

Persons conducting site checks and site assessments should consider at all times site-specific conditions dictating the level of personal protective equipment (PPE) that should be worn at the site. These conditions should be noted either visually or with monitoring equipment. PPE that may be required to be worn by personnel for UST field activities is described in WAC 296-62-3170. These regulations describe four levels of PPE: A, B, C, and D. Level A PPE is designed

to provide protection for very hazardous situations, and Level D is designed to provide protection for low-hazard situations.

Level D protection, which is the minimum level of protection that must be worn while conducting a site assessment, requires that workers wear:

- Steel toe/shank safety boots;
- Cotton or nomex coveralls;
- A hardhat; and
- Eye protection.

Federal Occupational Safety and Health Administration (OSHA) regulations (29 CFR Part 1910 subpart I -- Personal Protective Equipment) also describe types of PPE that may be required for field investigations. These types of PPE include:

- Eye and face protection;
- Respiratory protection;
- Occupational head protection;
- Occupational foot protection; and
- Electrical protection devices.

Table 4-1. Recommended Contents of a Site Safety Plan

-
- Brief Description and History of the Site.
 - Work Hazard Evaluation.
 - Field Activities and Tasks Covered by the Site Safety Plan.
 - Protective and Monitoring Equipment Requirements:
 - Personal protective equipment,
 - Monitoring equipment
 - Site Organization and Control of Workers.
 - Decontamination.
 - Personnel and Responsibilities:
 - Key personnel (and alternates) responsible for safety.
 - Emergencies:
 - Names and emergency functions of personnel responsible for emergency actions,
 - Duties of workers during an emergency,
 - Location of nearest medical or emergency care facilities and their capability to handle injury and chemical exposure cases,
 - Nearest poison control center,
 - Arrangements for treating, admitting, and transporting injured and/or exposed personnel,
 - Procedures for the decontamination and transport of injured workers to medical care facilities,
 - Procedures for evacuation of workers: warning signals, exits, internal and external communication plans.
 - Training and On-Site Briefing Topics.
 - Acknowledgement and Acceptance of Site Safety Plan.
-

4.4 PERSONNEL QUALIFICATIONS

Site assessments and site checks must be performed by a person registered with the department to perform site assessments as specified in WAC 173-360-610. All persons working on an UST site when contamination is present must have received health and safety training to meet the requirements of Chapter 296-62 WAC and all applicable federal, state and local regulations.

4.5 HAZARD COMMUNICATION

If a release of a hazardous substance as defined in Section 101(14) of the CERCLA Act of 1980 is found at an UST site, the finding must be reported to the department and also reported in accordance with all applicable local, state and federal laws. The finding must also be reported to other persons conducting the investigation according to Chapter 296-62 WAC. Chapter 296-62 WAC also requires that the hazards associated with these releases known to be present on the site be communicated to all individuals working on the site.

5.0 FIELD SAMPLING PROCEDURES

All UST site checks and site assessments shall include an appropriate level of field sampling to determine if a release has occurred. This section describes approaches and procedures for sampling soil and groundwater to investigate for an UST release, the required minimum number of samples to be collected, and appropriate sampling protocols. Although this section focuses on the sampling of petroleum substances in soil and groundwater, the procedures described may be applied to non-petroleum contaminants as well.

5.1 FIELD SCREENING

When conducting either a site check or a site assessment, the use of field instruments is recommended to help identify the source of a suspected release, including identification of areas that should be sampled which were not previously identified in the sampling plan. Field instruments are also useful for monitoring potential exposures and determining health and safety precautions. A number of field instruments may be used for field screening purposes. These instruments include photoionization detectors (PIDs), flame ionization detectors (FIDs), thin layer chromatography (TLC), portable gas chromatographs (GCs), colorimetric detector (Dräger tubes), and alkylation field chemistry kits (such as the "Hanby Field Test Kit"). PIDs and FIDs are useful for detecting and measuring released substances that have a volatile component (e.g. gasoline). PIDs and FIDs can measure groups of volatile organic vapors in soil (using a headspace technique) or in air. TLC offers the advantage of detection and semi-quantitative assessment of non-volatile petroleum residues. Portable GCs and colorimetric indicator tubes can measure specific analytes (e.g., benzene). Although portable GCs have a much greater potential sensitivity to low levels of contaminants than colorimetric tubes, they are more expensive and complex to operate.

Although all of the field instruments described above can be successfully used to measure for the presence of specific contaminants, they also have their limitations. Excessive reliance on field instruments can result in incorrect results, or results that are difficult to verify when performing subsequent laboratory analysis.

5.2 SOIL SAMPLING

The goal of a site check and site assessment is to collect sufficient data from a site to determine if a release has occurred by adequately identifying the presence of contamination where it is most likely to be present. Typically, the determination of whether a release has occurred relies on the use of field observation, field instruments and soil sampling. In most instances, the combination of these three sampling approaches is adequate for determining if a release has occurred (but not necessarily for characterizing the extent of contamination). Acceptable soil sampling procedures are described in the following sections and in Table 5-2.

5.2.1 Soils Characterization

For Ecology to adequately review site assessment reports, qualitative descriptions of the surface gradient and soils at the UST site need to be provided. To ensure that all site assessment reports use consistent language for characterizing soils, the terminology shown in the Unified Soil Classification System (Table 5-1) shall be used. Contaminant fate and transport is determined by soil characteristics and can influence the selection of sampling locations.

5.2.2 Soil Sampling Methods

Discrete grab samples should be collected and analyzed, unless otherwise indicated in this section. The collection of discrete samples minimizes potential problems associated with contaminant loss through volatilization, or non-detection of "hot spots" because of dilution (which frequently occurs when compositing samples).

When sampling from an open excavation, a minimum of six inches of soil must be removed to obtain soil samples from an unexposed area to minimize the loss of volatile contaminants.

Depending on site conditions, soil samples can be collected by one or more of the following sampling techniques:

- Hand auger/soil corer;
- Split spoon or shelly tube;
- Backhoe and hand tools; or
- Other approved techniques.

Table 5-1. Unified Soil Classification System
(ASTM Designation D-2487)

Major division			Group Symbols	Typical Names		
Coarse-grained soils	Gravels	Clean gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines		
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines		
			GM	Silty gravels, gravel-sand-silt mixtures		
			GC	Clayey gravels, gravel-sand-clay mixtures		
	Sands	Clean Sands	SW	Well-graded sands and gravelly sands, little or no fines		
			SP	Poorly graded sands and gravelly sands, little or no fines		
		Sands with fines	SM	Silty sands, sand-silt mixtures		
			SC	Clayey sands, sand-clay mixtures		
			Fine-grained soils	Silt and Clays	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
					CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
OL	Organic silts and organic silty clays of low plasticity					
MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts					
CH	Inorganic clays of high plasticity, fat clays					
OH	Organic clays of medium to high plasticity					
Highly organic soils		Pt			Peat, muck and other highly organic soils	

Each of these techniques is discussed briefly below.

Hand Auger/Soil Corer. A hand auger or soil corer may be used for collecting soil samples if site conditions permit the use of hand tools. The presence of large rocks, cemented soil layers, or extremely deep sample collection points may prevent the use of hand tools. The use of hand tools reduces the chance of puncturing tanks or piping systems, and is likely to be less expensive than using drill rigs and other power tools.

Once the sampling location has been reached, a liner can be inserted inside a soil corer for collecting the sample. Liners are useful for collecting relatively undisturbed samples. The use of a liner is not mandatory, and care must be taken to choose the correct liner so as not to influence results of analyses.

Split Spoon/Shelby Tube. Split spoon/Shelby tube sample collection devices require the use of drill rigs. There are two significant disadvantages to using a drill rig to collect soil samples. First, this method makes identifying the backfill/native soil interface, or other specified sampling depth, difficult. Second, the risk of puncturing the UST and/or delivery piping is much higher with a drill rig than with a hand tools. Before operating drilling rigs and other excavating equipment in the vicinity of known underground utilities, the appropriate utility companies should be contacted to determine the location of buried utilities. (This may be accomplished by contacting the Utilities Underground Location Center at 1-800-424-5555.) Extreme caution should be exercised by the operators of this equipment to avoid coming into contact with and damaging buried utilities. They should be properly licensed and comply with all applicable regulations.

When using either the split spoon sampler or Shelby tube, sample collection devices should be driven ahead of the auger flights in order to collect a relatively undisturbed sample. Use of liners for the split spoon sampler is recommended to ensure a representative sample. After the split spoon or Shelby tube has been tripped back out of the boring, the desired sample section should be removed from the sampling device, capped, taped, and labeled immediately. When taping, care should be exercised as taping can introduce minute quantities of some solvents into the sample.

Drill cuttings should be carefully collected and containerized, or piled on plastic and covered pending results of the sample analyses. Results of these analyses will determine

appropriate disposal requirements. All soil borings must be plugged and abandoned according to Chapter 173-160 WAC.

Backhoe and Hand Tools. In areas where subsurface soils are very rocky or large quantities of debris are present, a backhoe may be needed to excavate to the desired depth for sample collection. The backhoe is a useful tool for collecting samples to depths of up to twelve feet below the surface. As with the use of a drill rig, extreme caution should be exercised when using a backhoe in order to avoid puncturing the tank or piping system.

Soil samples may be collected directly from the backhoe bucket. To collect samples in this manner, the backhoe bucket should be cleaned prior to sampling. An excavation is then made to the desired depth and a bucket full of soil is removed from the desired sampling interval and brought to the surface. The sample must be collected from the soil in the middle of the bucket, away from the metal sides of the bucket. Surface soil shall not be incorporated into the sample.

When piled excavated soils are sampled, hand tools should be used to collect representative samples from the soil pile. Soil samples shall not be collected from the surface of the pile because surface soils may contain lower concentrations of contaminants as a result of volatilization. Composite samples may be used to evaluate excavated soils provided that only two individual field samples are composited equally and mixing occurs in the laboratory immediately before analysis.

5.2.3 Required Number and Locations of Soil Samples

The number of soil samples required to adequately sample a site during a site check or site assessment will differ among sites because of the variability among site conditions and among UST system designs, components, and installation methods. Soil samples from around a tank and associated piping system must be collected where field instruments indicate contamination exists, or where contamination is most likely to occur. The sampling depth where this often occurs is at the lowest point of the interface between the backfill material and native soil. The contrast in texture between the less permeable native soil and the relatively coarse-grained backfill material (customarily pea-gravel, crushed rock or sand) frequently impedes the progress of a released substance. If native soils were used as backfill materials or the interface is not discernable, and no evidence of contamination exists, soil samples must be collected one to two feet beneath the bottom of the tank or piping system. If groundwater is encountered within the

backfill material or within the excavation, the soil samples must be collected at the approximate top of the water table.

When selecting sampling locations, it should be taken into consideration that pathways for released product can also be created by sanitary and storm sewers, water lines, and other buried utility lines and utility trenches. These pathways allow released product, either liquid or vapor, to migrate in directions not anticipated by site soil characteristics or site hydrogeological conditions. Drywells, fill areas, basements, crawl spaces beneath residences and nearby wells are other possible migration paths for released product.

If field observation and field screening does not confirm contamination or identify more appropriate sampling locations, the minimum number and location of soil samples collected shall be as specified in Table 5-2. Deviations from these minimum requirements may be permitted on site-specific basis provided that alternative sampling procedures can be justified according to the procedures and criteria described in Section 3.4.

5.3 GROUNDWATER SAMPLING

Groundwater samples must be collected during a site check or site assessment when any of the following five conditions exist:

- The lowest point of the UST system (including piping) is located in groundwater;
- Field instruments indicate that a release may have occurred and the lowest point of the UST system, including piping, is within two feet of the seasonal high water table.
- Existing monitoring wells are already located on site and; (1) the condition of the monitoring wells allows for the collection of representative samples and, (2) the monitoring wells are located such that they will provide useful data;
- Physical conditions prevent collecting soil samples in accordance with the guidance provided in this document and groundwater sampling is used as part of an alternative sampling approach (see Section 3.4); or,
- Conditions associated with a site check suggest that immediate assessment of groundwater conditions is necessary to protect human health or the environment (e.g., a suspected release has occurred in the immediate vicinity of a drinking water well).

Table 5-2. Minimum Soil Sampling Requirements for Site Checks and Site Assessments

Site Check Sampling

Soil samples shall be collected where field instruments indicate contamination is most likely to be present. If no obvious contamination is detected during field screening, collect soil samples as follows: For tanks with a nominal capacity of less than 20,000 gallons, collect a minimum of three (3) soil samples around each tank - one from each end and one from the middle of one side. For tanks with a nominal capacity of 20,000 gallons or greater, collect a minimum of five (5) soil samples around each tank - one from each end, two on one side - one third of the way from each tank end - and one from the middle of the other side.

Also collect at least one soil sample at each dispensing island at a depth of two feet below where the piping enters the island. In addition, collect one soil sample from around the piping system for every fifty (50) feet of piping (i.e., one sample if less than 50 feet of piping exist, two samples for 50 to 99 feet, etc.). Soil samples around piping should be collected adjacent to piping joints or elbows and should be spaced to provide maximum distance between samples unless evidence indicates contamination is more likely to be present at different locations along the piping.

Site Assessment Sampling - Closure-In-Place

When conducting a site assessment for an UST in-place closure, sampling requirements are the same as those identified above for Site Check Sampling. However, if a building or other structure adjacent to or surrounding the tank prevents collecting samples at the ends or sides as described above, the following alternative sampling approach may be used: a minimum of three (3) samples must be collected through the bottom of the tank - one in the middle and one adjacent to each end - providing the tank is completely emptied of all product and sludges.

Site Assessment Sampling - Closure with Tank Removal

Following tank removal, the excavation should be closely observed for signs of contamination. If no obvious contamination is discovered, soil samples shall be collected as follows: a minimum of three (3) soil samples must be taken from the excavation pit when a single tank less than 20,000 gallons is being removed. One of the samples shall be collected from beneath the tank; the remaining two samples shall be taken from the sidewalls of the excavation (if composite samples are taken, sample two adjacent sides of the excavation at the same depth per composite sample). When a single tank greater than 20,000 gallons is being removed, a minimum of five (5) soil samples must be taken; one beneath the tank and one from each sidewall of the excavation pit. When multiple tanks are being removed from a single excavation pit, one additional sample shall be collected from beneath each additional tank being removed. In addition, a minimum number of discrete samples shall be collected from stockpiled excavated soil as shown in Table 5.3. The location of each of these samples shall be where field instrument readings indicate contamination is most likely to be present.

Sampling requirements for dispenser islands and piping are the same as those shown above for Site Check Sampling.

Site Assessment Sampling - Temporary Closure Extension or Change-In-Service

Sampling requirements for temporary closure extension or change-in-service are the same as those for site check sampling.

Table 5-3. Minimum Number of Samples From Stockpiled Excavated Soil

Cubic Yards of Soil	Minimum Number of Samples
0 - 100	3
101 - 500	5
501 - 1000	7
1001 - 2000	10
>2000	10 + 1 for each additional 500 cubic yards of soil

Water sampled directly from inside a tank excavation is not necessarily representative of normal groundwater conditions and should not be evaluated as a groundwater sample. Such samples may, however, be used to document the existence of a confirmed release.

Groundwater samples must be collected as described in Chapter 173-160 WAC. When groundwater sampling is required and the direction of groundwater flow is known, a minimum of three groundwater samples must be collected, one upgradient and two downgradient of the potential contamination source. When the direction of groundwater flow is unknown, at least four groundwater samples must be collected, with one groundwater sample collected midway along each of the four walls of the excavation.

If groundwater samples are collected from a monitoring well, the column of water in the well casing should be checked for the presence of non-aqueous phase liquids. Non-aqueous phase liquids include free petroleum products that may be either floating on top of the water or in a separate layer at the bottom of the well casing. Non-aqueous liquids can be identified by carefully lowering a clear bailer into the well before purging and observing the liquids removed from the top and the bottom of the water column, by using a paste type of detector on a stick, or by using an electronic device designed to detect non-aqueous liquids and measure the thickness of the non-aqueous layer.

Monitoring wells must be properly purged before collecting groundwater samples. This can be done by either removing at least three well volumes of water from each well before sample collection and/or by monitoring purge water temperature, pH, and conductivity until these parameters are stable. After purging the well and allowing the water level to equilibrate, the groundwater sample should be collected and transferred to a sample container with a minimum of disturbance or agitation to prevent loss of volatile organic compounds. All purged water shall be carefully collected, containerized, and stored for proper disposal pending evaluation of

groundwater sample analyses. The results of the analyses and applicable federal, state, and local water quality regulations dictate the method for disposal of the purge water.

Groundwater samples collected for laboratory analysis should be discrete grab (not composite) samples. Groundwater samples from monitoring wells are best collected using either bailers or positive displacement pumping systems. When sampling for petroleum products in groundwater, sampling devices made of glass, PTFE (Teflon), or stainless steel are most desirable because of their inert nature. Container requirements are described in Section 5.5. If groundwater samples are to be analyzed for metals, unfiltered samples should be submitted for analysis unless it can be demonstrated that filtered samples provide a more representative measure of groundwater quality.

5.4 HIGHLY CONTAMINATED MEDIA

During a site check or site assessment, free product or soils heavily saturated with released regulated substances may be encountered. This may include, but is not limited to, pools of free product on the ground surface or in excavations, highly-contaminated (e.g., oil-soaked or saturated) soil or backfill material, and non-aqueous liquids floating (or sinking) in water. *When liquid-free product or highly contaminated soil is discovered, the release is considered to be confirmed and no further sampling is required for completion of the UST site check or site assessment.* The person performing the site check or site assessment must report to the department and the tank owner the existence of the confirmed release as specified in WAC 173-360-630. A site characterization will then need to be performed in accordance with WAC 173-340-450.

5.5 SAMPLE CONTAINERS, PRESERVATION METHODS, AND HOLDING TIMES

The most common, and also most desirable, containers for most environmental sampling are made of borosilicate glass with PTFE (Teflon) lined caps. Containers may be either purchased from a supplier of certified clean containers, or pre-cleaned containers may be acquired from a selected laboratory. After collection, samples must be properly preserved until analyzed. Volatile samples must be kept cool and tightly sealed. Samples should be delivered to the laboratory performing the analyses within 48 hours of collecting the samples. Arrangements should be made with the laboratory to ensure that the required analyses are completed and results made available within the specified holding time. The recommended type and number of containers for environmental samples and the recommended preservation

methods and holding times are shown in Table 5-4. These recommendations are based on methods used at the Manchester Environmental Laboratory.

5.6 DECONTAMINATION PROCEDURES

Decontamination of personnel, sampling equipment, and containers prior to and after sampling is required to ensure collection of representative samples and to prevent the potential spread of contamination. Decontamination of personnel prevents ingestion and absorption of contaminants and is most readily accomplished by using a soap and water wash, and a water rinse. The rinse water must be de-ionized water.

All sampling equipment must be properly decontaminated before beginning sampling and between sampling locations. This will prevent introduction of contamination into uncontaminated samples and avoid cross-contamination of samples. Cross-contamination can be a significant problem when attempting to identify extremely low concentrations of organic compounds or when working with soils that are locally highly contaminated.

In most sampling situations, thorough scrubbing with a stiff brush in a solution of water and laboratory detergent such as Alconox or another similar product, followed by a thorough rinse with de-ionized water, may be adequate to clean sampling equipment. If concentrated petroleum products or highly-contaminated soils are encountered during sampling, then an appropriate solvent may be required to remove heavy petroleum residues from sampling equipment.

The exterior portion of sample containers should be cleaned after samples are collected and the container lids are tightly sealed. Exterior container decontamination procedures are similar to the those described above for cleaning sampling equipment; however, solvent washing of the container should never be done because of the potential to contaminate the sample.

Washwater and rinsate solutions used for decontamination must be collected in appropriate containers and disposed of properly in accordance with federal, state, and local regulations.

**Table 5-4. Recommended Container,
Preservation Method, and Holding Time for Environmental Samples**

<u>Matrix</u>	<u>Analysis</u>	<u>Container</u>	<u>Containers per Sample</u>	<u>Preservation Method</u>	<u>Holding Time</u>
Soil	Volatile Organic Compounds	8 oz. wide mouth glass jar with Teflon lid liner	1	Cool to 4°C Protect from light Minimize headspace	14 days
	Total Petroleum Hydrocarbons	8 oz. wide mouth glass jar with Teflon lid liner	1	Cool to 4°C	— ^b
	Priority Pollutant Scan	8 oz. wide mouth glass jar with Teflon lid liner	1	Cool to 4°C	14 days
Water	Volatile Organic Compounds	40 mL glass vials with Teflon-lined septum caps	2	Cool to 4°C 2 drops 1:1 HCl ^a Protect from light Eliminate headspace	14 days
	Total Petroleum Hydrocarbons	1 liter glass jar with Teflon lid liner	1	Cool to 4°C 5.0 mL 1:1 HCl	— ^b
	Oil and Grease	1 liter wide mouth glass jar	1	Cool to 4°C sulfuric acid to pH <2	28 days
	Hydrocarbon Identification	1 liter narrow mouth amber glass bottle	1	Cool to 4°C 2.0 mL hexadecane	—
	Priority Pollutant Scan	1/2 or 1 gallon glass jar with Teflon lid liner	1	Cool to 4°C	7 days
		40 mL glass vials with Teflon-lined septum caps	2	Cool to 4°C	7 days
		1 liter cubitainer	1	Cool to 4°C	7 days
		16 oz. glass jars	2	Cool to 4°C	7 days
Free Product	Hydrocarbon Identification	40 mL glass vial with Teflon-lined septum cap	1	Cool to 4°C	—

^a The laboratory may provide containers with appropriate amount of acid or other preservative added.

^b 28 days for Method 418.1, and 14 days for Method 8015.

—^a Not yet established.

6.0 SAMPLE ANALYTICAL REQUIREMENTS

6.1 CONTAMINANTS COMMONLY ASSOCIATED WITH GASOLINE UST RELEASES

Gasoline is a complex mixture of hydrocarbons composed of over 200 constituents. Assessing the extent of environmental contamination after release from an UST is complicated by the fact that gasoline constituents tend to separate into four phases following release from an UST: (1) vapors, (2) dissolved in groundwater, (3) adsorbed to soil, and (4) floating on groundwater. Persons conducting site checks and site assessments need to understand how gasoline constituents separate following release and how these constituents may change over time.

The fate and transport of gasoline and its major constituents following release from an UST is shown in Figure 6-1. Gasoline vapors consist of the lighter, shorter chain, components of paraffins, aromatics, and olefins. The vapors typically consist mostly of paraffins, 84 to 93 percent. Aromatic compounds typically comprise less than three percent of gasoline vapors. However, the aromatic compounds are the most water-soluble constituents of gasoline, comprising more than 95 percent of the dissolved constituents. As a result, the composition of gasoline constituents dissolved in groundwater is heavily dominated by aromatics, such as benzene, ethylbenzene, toluene, and xylene (BETX).

Constituents such as BETX, which are often used to identify a recent gasoline release, may be present at the site of an older release only in small quantities. In fact, with time, the residual constituents from a gasoline spill may resemble constituents from a fuel oil spill. Older spills, however, may retain pockets of material resembling free product. In these cases, constituents such as BETX may be present in these pockets at concentrations similar to those found at a new spill.

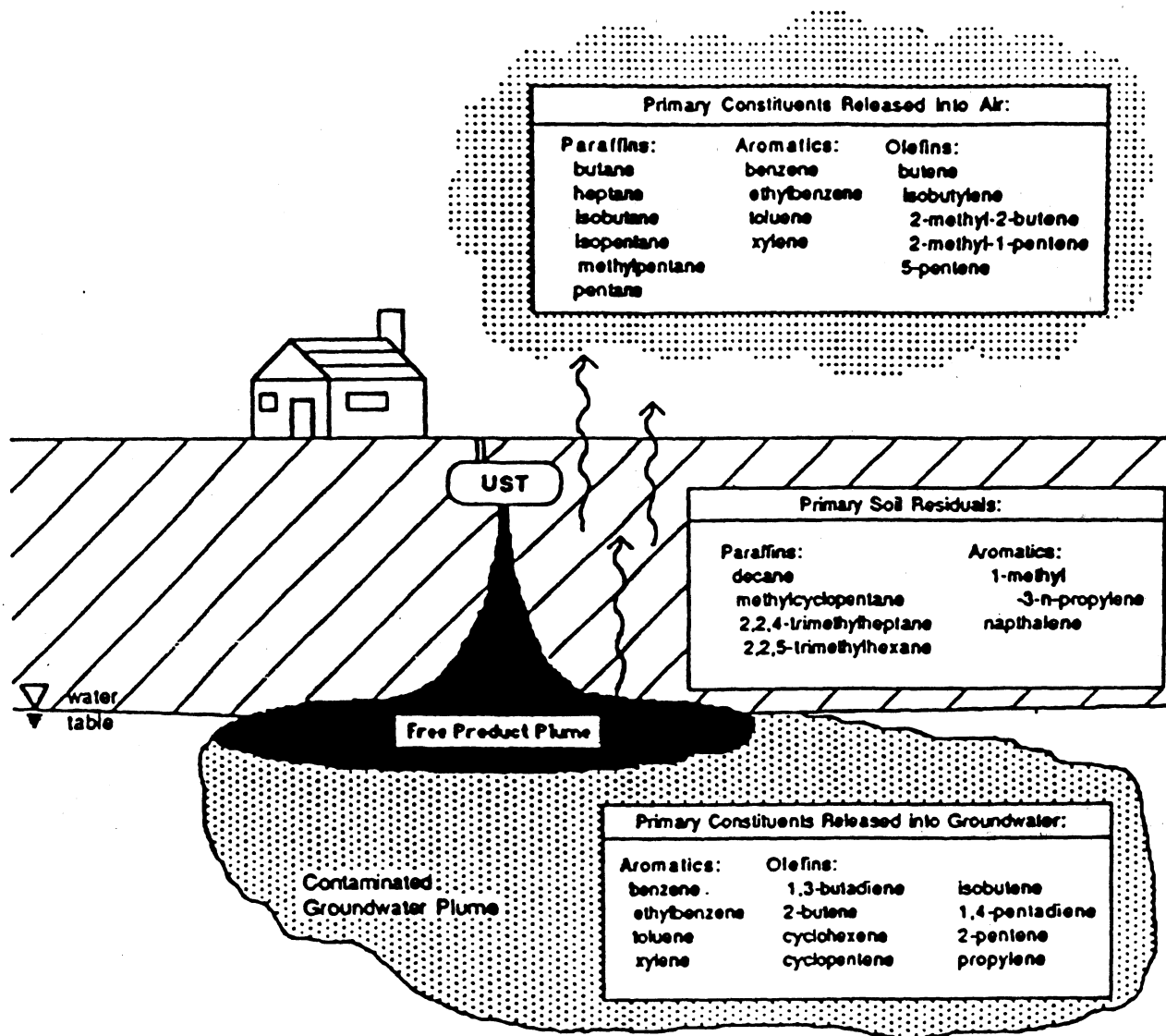


Figure 6-1. Fate and Transport of Selected Gasoline Constituents
(Prepared by ICF Technology for the U.S. Environmental Protection Agency)

6.2 REQUIREMENTS FOR LABORATORY ANALYSIS

The minimum requirements for laboratory analyses depend on what is known regarding the type of substances stored in the UST(s). Because the purpose of conducting a site check or site assessment is to determine if a release has occurred rather than to characterize the extent of a release, not all contaminants suspected to be present need to be identified and measured. Typically, the required laboratory analyses specified in this section will be adequate to confirm a suspected release. It is the responsibility of the person conducting a site check or site assessment to ensure the appropriate analyses are conducted to determine if a release has occurred.

Table 6-1 shows required and recommended analyses for petroleum substances. The specific analytical methods used must be able to detect a constituent at or below the action levels identified in Table 8-2 of this document. If the product stored in the UST is a non-petroleum hazardous substance and the type of substance is known, the appropriate analyses should be made for that hazardous substance along with the most common byproducts associated with the substance. In situations where the type of substance stored is unknown, or where the appropriate analyses are not known, Ecology's Environmental Assessment Program should be contacted for advice on the correct analyses to perform.

Analysis request forms should be submitted to the laboratory with the samples to indicate which tests are requested to be run on each sample. Analysis request forms should be obtained from the laboratory conducting the analyses.

Table 6-1
Required Testing for Petroleum Releases.

	Gasoline Range Organics (GRO) (1)	Diesel Range Organics (DRO) (2)	Heavy Oils (DRO) (3)	Mineral Oils (4)	Waste Oils and Unknown Oil (5)
Volatile Petroleum Compounds					
Benzene	X (6)	X (7)			X (8)
Toluene	X (6)	X (7)			X (8)
Ethyl benzene	X (6)	X (7)			X (8)
Xylenes	X (6)	X (7)			X (8)
n-Hexane	X (9)				
Fuel Additives and Blending Compounds					
Dibromoethane, 1-2 (EDB); and Dichloroethane, 1-2 (EDC)	X (10)				X (8)
Methyl tertiary-butyl ether (MTBE)	X (11)				X (8)
Total Lead and Other Additives	X (12)				X (8)
Other Petroleum Components					
Carcinogenic PAHs		X (13)	X (13)		X (8)
Naphthalenes	X (14)	X (14)	X (14)		X (14)
Other Compounds					
Polychlorinated Biphenyls (PCBs)			X (15)	X (15)	X (8)
Halogenated Volatile Organic Compounds (VOCs)					X (8)
Other	X (16)	X (16)	X (16)	X (16)	X (16)
Total Petroleum Hydrocarbons Methods					
TPH Analytical Method for Total TPH (Method A Cleanup Levels) (17)	NWTPH-Gx	NWTPH-Dx	NWTPH-Dx	NWTPH-Dx	NWTPH-Gx & NWTPH-Dx
TPH Analytical Methods for TPH fractions (Methods B or C) (17)	VPH	EPH	EPH	EPH	VPH and EPH

[Editor's Note: See next page for the footnotes associated with Table 6-1.]

MTCA Cleanup Regulation

Use of Table 830-1: An "X" in the box means that the testing requirement applies to ground water and soil if a release is known or suspected to have occurred to that medium, unless otherwise specified in the footnotes. A box with no "X" indicates (except in the last two rows) that, for the type of petroleum product release indicated in the top row, analyses for the hazardous substance(s) named in the far-left column corresponding to the empty box are not typically required as part of the testing for petroleum releases. However, such analyses may be required based on other site-specific information. Note that testing for Total Petroleum Hydrocarbons (TPH) is required for every type of petroleum release, as indicated in the bottom two rows of the table. The testing method for TPH depends on the type of petroleum product released and whether Method A or Method B or C is being used to determine TPH cleanup levels. See WAC 173-340-830 for analytical procedures. The footnotes to this table are important for understanding the specific analytical requirements for petroleum releases.

Footnotes:

- (1) The following petroleum products are common examples of GRO: automotive and aviation gasolines, mineral spirits, stoddard solvents, and naphtha. To be in this range, 90 percent of the petroleum components need to be quantifiable using the NWTPH-Gx; if NWTPH-HCID results are used for this determination, then 90 percent of the "area under the TPH curve" must be quantifiable using NWTPH-Gx. Products such as jet fuel, diesel No. 1, kerosene, and heating oil may require analysis as both GRO and DRO depending on the range of petroleum components present (range can be measured by NWTPH-HCID). (See footnote 17 on analytical methods.)
- (2) The following petroleum products are common examples of DRO: Diesel No. 2, fuel oil No. 2, light oil (including some bunker oils). To be in this range, 90 percent of the petroleum components need to be quantifiable using the NWTPH-Dx quantified against a diesel standard. Products such as jet fuel, diesel No. 1, kerosene, and heating oil may require analysis as both GRO and DRO depending on the range of petroleum components present as measured in NWTPH-HCID.
- (3) The following petroleum products are common examples of the heavy oil group: Motor oils, lube oils, hydraulic fluids, etc. Heavier oils may require the addition of an appropriate oil range standard for quantification.
- (4) Mineral oil means non-PCB mineral oil, typically used as an insulator and coolant in electrical devices such as transformers and capacitors.
- (5) The waste oil category applies to waste oil, oily wastes, and unknown petroleum products and mixtures of petroleum and nonpetroleum substances. Analysis of other chemical components (such as solvents) than those listed may be required based on site-specific information. Mixtures of identifiable petroleum products (such as gasoline and diesel, or diesel and motor oil) may be analyzed based on the presence of the individual products, and need not be treated as waste and unknown oils.
- (6) When using Method A, testing soil for benzene is required. Furthermore, testing ground water for BTEX is necessary when a petroleum release to ground water is known or suspected. If the ground water is tested and toluene, ethyl benzene or xylene is in the ground water above its respective Method A cleanup level, the soil must also be tested for that chemical. When using Method B or C, testing the soil for BTEX is required and testing for BTEX in ground water is required when a release to ground water is known or suspected.
- (7)(a) For DRO releases from other than home heating oil systems, follow the instructions for GRO releases in Footnote (6).
- (b) For DRO releases from typical home heating oil systems (systems of 1,100 gallons or less storing heating oil for residential consumptive use on the premises where stored), testing for BTEX is not usually required for either ground water or soil. Testing of the ground water is also not usually required for these systems; however, if the ground water is tested and benzene is found in the ground water, the soil must be tested for benzene.
- (8) Testing is required in a sufficient number of samples to determine whether this chemical is present at concentrations of concern. If the chemical is found to be at levels below the applicable cleanup level, then no further analysis is required.
- (9) Testing for n-hexane is required when VPH analysis is performed for Method B or C. In this case, the concentration of n-hexane should be deleted from its respective fraction to avoid double-counting its concentration. n-Hexane's contribution to overall toxicity is then evaluated using its own reference dose.
- (10) Volatile fuel additives (such as dibromoethane, 1-2 (EDB) (CAS# 106-93-4) and dichloroethane, 1-2 (EDC) (CAS# 107-06-2)) must be part of a volatile organics analysis (VOA) of GRO contaminated ground water. If any is found in ground water, then the contaminated soil must also be tested for these chemicals.
- (11) Methyl tertiary-butyl ether (MTBE) (CAS# 1634-04-4) must be analyzed in GRO contaminated ground water. If any is found in ground water, then the contaminated soil must also be tested for MTBE.
- (12)(a) For automotive gasoline where the release occurred prior to 1996 (when "leaded gasoline" was used), testing for lead is required unless it can be demonstrated that lead was not part of the release. If this demonstration cannot be made, testing is required in a sufficient number of samples to determine whether lead is present at concentrations of concern. Other additives and blending compounds of potential environmental significance may need to be considered for testing, including: tertiary-butyl alcohol (TBA); tertiary-amyyl methyl ether (TAME); ethyl tertiary-butyl ether (ETBE); ethanol; and methanol. Contact the department for additional testing recommendations regarding these and other additives and blending compounds.
- (b) For aviation gasoline, racing fuels and similar products, testing is required for likely fuel additives (especially lead) and likely blending compounds, no matter when the release occurred.
- (13) Testing for carcinogenic PAHs is required for DRO and heavy oils, except for the following products for which adequate information exists to indicate their absence: Diesel No. 1 and 2, home heating oil, kerosene, jet fuels, and electrical insulating mineral oils. The carcinogenic PAHs include benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, benzo(k)fluoranthene, benzo(a)anthracene, and benzo(b)fluoranthene.
- (14)(a) Except as noted in (b) and (c), testing for the non-carcinogenic PAHs, including the "naphthalenes" (naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene) is not required when using Method A cleanup levels, because they are included in the TPH cleanup level.
- (b) Testing of soil for naphthalenes is required under Methods B and C when the inhalation exposure pathway is evaluated.
- (c) If naphthalenes are found in ground water, then the soil must also be tested for naphthalenes.
- (15) Testing for PCBs is required unless it can be demonstrated that: (1) the release originated from an electrical device manufactured for use in the United States after July 1, 1979; (2) oil containing PCBs was never used in the equipment suspected as the source of the release (examples of equipment where PCBs are likely to be found include transformers, electric motors, hydraulic systems, heat transfer systems, electromagnets, compressors, capacitors, switches and miscellaneous other electrical devices); or, (3) the oil released was recently tested and did not contain PCBs.
- (16) Testing for other possible chemical contaminants may be required based on site-specific information.
- (17) The analytical methods NWTPH-Gx, NWTPH-Dx, NWTPH-HCID, VPH, and EPH are methods published by the Department of Ecology and available on the department's Internet web site: <http://www.ecy.wa.gov/programs/tcp/cleanup.html>.

7.0 QUALITY ASSURANCE AND QUALITY CONTROL REQUIREMENTS

During a site assessment or site check, samples must be collected and analyzed with sufficient quality assurance and quality control (QA/QC) procedures in order to ensure representative and reliable results. The validity of both sampling techniques and laboratory analytical procedures must be assured so that the data from sampling activities can be used to accurately assess the presence or absence of contamination at the site.

7.1 LABORATORY QUALITY CONTROL/QUALITY ASSURANCE

At the present time, Ecology has a list of accredited laboratories for performing water analyses, including groundwater analyses. This means that all surface water and groundwater samples must be submitted to a laboratory accredited under Chapter 173-50 WAC. A listing of laboratories accredited to perform water analyses may be obtained from Ecology's Environmental Investigations and Laboratory Services Program (EILS).

A similar accreditation program for soil analyses does not presently exist, but is anticipated to be established within the next few years. In the mean time, laboratories that perform chemical analyses of soils for UST site checks and site assessments should routinely use appropriate quality control and quality assurance procedures that are at least as stringent as those identified in Manchester Environmental Laboratory's "Laboratory User's Manual". Copies of this manual can be obtained on a limited basis from the Manchester Environmental Laboratory.

Analysis of check standards, duplicate samples, spike samples, and blanks should be routinely run because they provide information for interpreting the accuracy, precision, and detection capabilities of the analytical procedures used. Check standards are used to estimate the precision of the method and to check for bias due to calibration. Duplicate analyses of samples are used to check the precision of the actual samples. Spikes are used to test for bias due to chemical interference. Blanks are used to estimate the limit of detection of the method and to check for laboratory contamination.

Laboratories are required to routinely use QA/QC procedures. Persons who perform site checks or site assessments have two alternative approaches to verify that these requirements are met:

1. Obtain a letter from the laboratory director stating that the laboratory operates and maintains records of its QA/QC program for samples from site checks and site assessments and that their results meet the standards identified in this document; or,
2. Obtain from the laboratory the QA/QC results run with each batch of laboratory analyses performed for addition to the detailed records of the site check or site assessment. QA/QC data is to be reviewed by the person conducting the site check or site assessment and ultimately delivered to the owner along with the other documented results of the site check or site assessment.

7.2 FIELD QUALITY CONTROL/QUALITY ASSURANCE

Field QA/QC should include one duplicate sample collected for each sampled matrix (soil, groundwater, free product, etc.) to provide an estimate of the total variability in the sampling and analytical procedures. Duplicate samples submitted to the laboratory must be given a unique identifying number. A transport blank should also accompany samples collected from each sampled matrix.

Generally, transfer and rinsate blanks are not required for site assessment/site check sampling because of the minimal nature of these investigations. If further investigations are necessary, due to the confirmation of a release, then blanks will be included in the Quality Assurance Project Plan for further investigation of the site.

7.3 DOCUMENTATION OF FIELD ACTIVITIES

A field notebook should be used by the person conducting a site check or site assessment to record times, dates, and locations of all samples as well as daily events, observations, field measurements, and any other applicable information obtained during the field investigation. All entries should be made in ink, signed, and dated. Photographs should be taken of each sampling location and of any unusual circumstances encountered in the investigation. Field notebooks and photographs should be kept for a minimum of five years to help reconstruct sampling procedures and to aid, if necessary, in legal testimony. Additional information on documentation and custody can be found in EPA/600/4-84/075, "Characterization of Hazardous Waste Sites-- A Methods Manual, Volume 1-- Site Investigations."

7.4 CHAIN OF CUSTODY

All samples must be placed immediately in appropriate containers (see Section 5.5) which should be tightly sealed, decontaminated and cooled on ice. Samples should be labelled with the following information:

- Unique identifying number assigned to the sample for laboratory analysis;
- Date and time of collection;
- Site address and location of sample;
- Name of person taking sample;
- Project name;
- Analyses requested; and
- Preservation method.

A chain of custody sheet must be filled out and completed for all samples submitted for analysis. This sheet shall be maintained from the time the sample is collected to the time it is submitted to the laboratory. It should include sampler's name(s); sample container type and number; date and time of collection; sample collection location(s); analyses to be performed; dates and signatures of those releasing and receiving the samples; date and time samples were received by the laboratory; and total number of samples received.

Sample custody seals must be used when samples are shipped to the laboratory or when they are delivered to the laboratory after working hours. These seals must be signed by the sampler and must be affixed to the sample cooler in a way that would necessitate breaking the seal in order to open the cooler. If samples are delivered directly to the laboratory by the sampler, sample seals are not necessary. Chain of custody procedures are detailed further in the "Laboratory User's Manual".

8.0 RESULTS EVALUATION AND REPORTING REQUIREMENTS

If the results from a site check or site assessment confirm that a release has occurred, owners/operators are required under WAC 173-360-399 to immediately undertake appropriate measures in accordance with Chapter 173-340 WAC. Section 8.1 provides guidance for evaluating field sampling and analyses results for a site check or site assessment. Section 8.2 summarizes the subsequent notification and reporting requirements.

8.1 EVALUATION OF FIELD SAMPLING RESULTS

The objective of the site check/site assessment is to determine whether a release of a regulated substance has occurred and if further investigation is necessary. This determination shall be made by comparing indicator constituent concentrations in the samples collected to soil and groundwater action levels for those constituents.

The indicator constituents to be used to evaluate site check/site assessment samples depend on the type of substance stored in the tank. The guidance for evaluating sampling results is divided into two categories -- USTs containing petroleum substances and USTs containing non-petroleum hazardous substances.

8.1.1 Evaluation of Results for Petroleum Substances

Site check or site assessment samples for USTs that contain petroleum substances must be analyzed according to the petroleum product or products that historically have been stored in the tank. Indicator constituents and required analyses for UST sites where petroleum substances are stored are shown in Table 6-1. Table 8-1 and 8-2 list soil and groundwater action levels for these indicator constituents. With one exception, these action levels are the Method A Compliance Cleanup Levels specified in Chapter 173-340 WAC. The exception is the action level for benzene in groundwater, which is the criterion listed in Chapter 173-200 WAC, Water Quality Standards for Groundwaters of the State of Washington. *If the concentration for any of these indicator constituents in any of the samples is above the appropriate action level, a release is confirmed and the registered person performing the site check/site assessment must notify the owner or operator and the department according to the requirements presented in Section 8.2.1.* Further investigation and, possibly, cleanup may be required.

Table 8-1^a Method A Soil Cleanup Levels for Unrestricted Land Uses

<u>Hazardous Substance</u>	<u>Cleanup Level</u>
Benzene	0.03 mg/kg
Ethylbenzene	6 mg/kg
Lead	250 mg/kg
MTBE	0.1 mg/kg
Toluene	7 mg/kg
Xylenes	9 mg/kg

Total Petroleum Hydrocarbons:

1) Gasoline Range Organics ^b

With no Benzene detected and with Ethylbenzene, Toluene, and Zylenes less than 1% of gasoline mixture	100 mg/kg
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All other gasoline mixtures	30 mg/kg
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2) Diesel Range Organics ^c	2,000 mg/kg
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3) Heavy Oils ^d	2,000 mg/kg
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4) Mineral Oil ^e	4,000 mg/kg
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^aSee WAC 173-340-900 for caution on misusing the values in this table.

^bGasoline range organics denotes organic compounds measured using method NWTPH-Gx.

^cDiesel range organics means organic compounds measured using NWTPH-Dx.

^dHeavy oils means organic compounds measured using NWTPH-Dx.

^eMineral oil means non-PCB mineral oil, typically used as an insulator and coolant in electrical devices such as transformers and capacitors measured using NWTPH-Dx.

Table 8-2^a Method A Cleanup Levels for Ground Water

<u>Hazardous Substance</u>	<u>Cleanup Level</u>	
Benzene	5	µg/liter
Ethylbenzene	700	µg/liter
Lead	15	µg/liter
MTBE	20	µg/liter
Toluene	1,000	µg/liter
Xylenes	1,000	µg/liter

Total Petroleum Hydrocarbons:

1) Gasoline Range Organics ^b

With Benzene detected in water	800	µg/liter
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No detectable Benzene in water	1,000	µg/liter
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2) Diesel Range Organics ^c	500	µg/liter
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3) Heavy Oils ^d	500	µg/liter
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4) Mineral Oil ^e	500	µg/liter
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^aSee WAC 173-340-900 for caution on misusing the values in this table.

^bGasoline range organics denotes organic compounds measured using method NWTPH-Gx.

^cDiesel range organics means organic compounds measured using NWTPH-Dx.

^dHeavy oils means organic compounds measured using NWTPH-Dx.

^eMineral oil means non-PCB mineral oil, typically used as an insulator and coolant in electrical devices such as transformers and capacitors measured using NWTPH-Dx.

8.1.2 Evaluation of Results for non-petroleum hazardous substances

For USTs that contain a non-petroleum hazardous substance, as defined in WAC 173-360-120, samples from a site check or site assessment must be analyzed for the hazardous substance and the most common byproducts associated with the hazardous substance (see Section 6.2). Results of these analyses shall be compared to the Method A compliance cleanup levels for groundwater, soil, and industrial soil listed in Chapter 173-340 WAC. If the concentration for any of these constituents in any of the samples is above the appropriate compliance cleanup level, a release is “confirmed,” and the person performing the site check/site assessment must notify the owner or operator and the department as specified in Section 8.2.1. Further investigation and, possibly, cleanup may be required.

Special Note: **Non-petroleum** hazardous substances may require testing in-accordance with-WAC 173-303.

8.2 REPORTING REQUIREMENTS

8.2.1 Release Notification

WAC 173-360-372 requires UST owners and operators to report all confirmed releases to the department or delegated agency within 24 hours. WAC 173-360-630 requires the person conducting the site check or site assessment to report to the department and the tank owner or operator the existence of any confirmed release from an underground storage tank system that poses a threat to human health and the environment. This report shall be provided to the tank owner or operator immediately, and to the department within 72 hours of the discovery of the condition. If the owner or operator is not immediately available, the report should be made immediately to the department. In addition, WAC 173-360-360 requires that owners/operators of USTs must report any of the following conditions to the department or delegated agency within 24 hours:

- Discovery of a released regulated substance at an UST site or surrounding area;
- Unusual operating conditions; or,
- Monitoring results from a release detection method that-indicate a release-may have occurred.

8.2.2 Reporting Requirements

A person conducting a site check or site assessment *where a release has not been confirmed and reported*, must submit a Site Check/Site Assessment checklist to the department within 30 days following the completion of the site check/site assessment. A site check/site assessment report must be included with the checklist and shall include the following items:

- The name of the person registered with the department who conducted the site check or site assessment and the firm he or she is affiliated with;
- Location of the UST site on a vicinity map;
- A brief summary of information obtained during the site inspection conducted prior to field sampling including direction of surface gradient surrounding the UST system (see Section 3.2);
- UST system data (see Section 3.1);
- Soil characteristics (see Section 5.2);
- Any apparent groundwater in the tank excavation;
- Brief description of surrounding land use (see Section 3.1);
- A summary of the field sampling activities conducted, including the number and types of samples that were collected, the methods used to collect and analyze the samples, and the name and address of the laboratory used to perform the analyses. The summary also must note where sampling procedures which differ from those specified in this guidance were used and provide justification for using these alternative procedures (see Section 3.4);
- A site sketch or sketches showing the location and the unique identifying number for all field samples collected for laboratory analysis; distinguish any groundwater samples collected from soil samples; show sample depth; indicate samples collected from excavated soils; show tank and piping locations and approximate

limits of excavation pit; show North arrow, adjacent structures, on-site and nearby utilities and adjacent streets.

- A description of any factors that may have compromised the quality of the data or validity of the results;
- A table showing, for each field sample collected, laboratory results for all Indicator constituents analyzed, including the analytical method used and the detection limit for that method. Sample results shall be labeled with the unique identifying number assigned to the sample; indicate if any samples analyzed were composite samples; and,
- Conclusions as to whether a release of a regulated substance from the UST system investigated has occurred.

The Site Check/Site Assessment report and checklist must be signed by the registered person performing the site check or site assessment.

APPENDIX A -- RECOMMENDED READING/TRAINING DOCUMENTS

American Conference of Governmental Industrial Hygienists, 1987. TLVs -Threshold Limit Values and Biological Exposure Indices for 1987-1988. ACGIH, Cincinnati, Ohio. (as amended and updated).

American Petroleum Institute Recommended Practice 1604, "Removal and Disposal of Used Underground Petroleum Storage Tanks".

American Petroleum Institute Recommended Practice 1628, "A Guide to the Assessment and Remediation of Underground Petroleum Releases".

American Petroleum Institute Recommended Practice 1631, "Interior Lining of Underground Storage Tanks".

American Petroleum Institute Recommended Practice 2015, "Cleaning Petroleum Storage Tanks".

Department of Ecology. 1988. "Laboratory User's Manual".

Department of Ecology. 1989. "Guidelines for Preparation of Quality Assurance Project Plans for State of Washington Leaking Underground Storage Tank (LUST) Program".

NIOSH/OSHA/USCG/EPA, 1985. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities. NIOSH Publication No. 85-115.

The National Institute for Occupational Safety and Health "Criteria for a Recommended standard... Working in Confined Space."

Sax and Lewis, 1987. Hawley's Condensed Chemical Dictionary, 11th Edition. Van Nostrand Reinhold Company, New York, New York.

Sax and Lewis, 1986. Rapid Guide to Hazardous Chemicals in the Workplace. Van Nostrand Reinhold Company, New York, New York.

Ted Pettit and Herb Linn, 1987. A Guide to Safety in Confined Spaces. NIOSH Publication No. 87-113.

U.S. Department of Health and Human Services, 1985. NIOSH Pocket Guide to Chemical Hazards. NIOSH Publication No. 85-114.

U.S. Environmental Protection Agency. 1988. "Cleanup of Releases from Petroleum USTs: Selected Technologies", (EPA/530/UST-88/001).

U.S. Environmental Protection Agency. 1990. "Assessing UST Corrective Action Technologies: Early Screening of Cleanup Technologies for the Saturated Zone", (EPA 600/2-90/027).

U.S. Environmental Protection Agency. 1990. "Assessing UST Corrective Action Technologies: Site Assessment and Selection of Unsaturated Zone Treatment Technologies", (EPA 600/2-90/011).

U.S. Environmental Protection Agency. 1990. "Leaking USTs and Health: Estimating Health Risks from Petroleum Contamination", (EPA 530/UST-90/013).

U.S. Environmental Protection Agency. 1991. "Site Characterization for Subsurface Remediation", (EPA/625/4-91/026).

U.S. Environmental Protection Agency. 1990. "Field Measurements: Dependable Data When You Need It", (EPA 530/UST-90/003).

U.S. Environmental Protection Agency. 1984. "Characterization of Hazardous Waste Sites -- A Methods Manual: Volume I -- Site Investigations", (EPA 600/4-84-075).

U.S. Environmental Protection Agency. 1984. "Characterization of Hazardous Waste Sites -- A Methods Manual: Volume II. Available Sampling Methods, Second Edition" (Appendix D), (EPA 600/4-84-076).

U.S. Environmental Protection Agency, Guidance QAMS-005/80, "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans".

U.S. Environmental Protection Agency. 1977, "Procedures Manual for Ground Water Monitoring at Solid Waste Disposal Facilities", (EPA 530/SW-61).

U.S. Environmental Protection Agency, Office of Underground Storage Tanks, "UST Inspectors Safety and Health Manual".

U.S. Environmental Protection Agency. "Safety in Site Investigations", (EPA/600/4-84/075).

APPENDIX B -- LISTING OF REGULATIONS CITED IN THIS DOCUMENT

<u>Chapter 173-160 WAC</u>	Accreditation of Environmental Laboratories
<u>Chapter 173-160 WAC</u>	Minimum Standards for Construction and Maintenance of Wells
<u>Chapter 173-200 WAC</u>	Water Quality Standards for Ground Waters of the State of Washington
<u>Chapter 173-303 WAC</u>	Dangerous Waste Regulations
<u>Chapter 173-340 WAC</u>	The Model Toxics Control Act Cleanup Regulation

